THE EFFECTS OF A TACTILE PROMPTING DEVICE ON THE REQUESTING BEHAVIOR OF A CHILD WITH AUTISM

Lori A. Russo, B. A.

Thesis for the Degree of

MASTER OF SCIENCE

UNIVERSITY OF NORTH TEXAS

December 1999

APPROVED:

Shahla Alai-Rosales, Major Professor
Jesus Rosales-Ruiz, Committee Member
Richard Smith, Committee Member
Joel Greenspoon, Committee Member
Sigrid Glenn, Chair of the Department of Behavior Analysis
David Hartman, Dean of the School of Community Service
C. Neal Tate, Dean of the Robert B. Toulouse School of Graduate Studies

Russo, Lori A., The effects of a tactile prompting device on the requesting behavior of a child with autism. Master of Science (Behavior Analysis), December 1999, 61 pp., 3 tables, 6 illustrations, references, 30 titles.

In the present experiment, a remote control tactile prompting device (RCT) was utilized to prompt a child with autism to recruit teacher models and play suggestions. A multiple baseline and reversal was used to assess the effects of the RCT across three play contexts. The results showed increases in the number of requests for models and suggestions as well as increases in the duration of interactive play between the child and therapist, the number of contextual statements emitted by the child, and the topography and contexts of the play behaviors emitted by the child. Findings are discussed in terms of the effectiveness and generality of the RCT and the issue of teaching a child to recruit versus teaching a child activity-specific behaviors.

ACKNOWLEDGMENTS

I would like to thank my thesis chair, Dr. Shahla Alai-Rosales for her guidance and support throughout my educational journey. Working under her direct supervision with NTAP has provided me with the opportunity to improve the lives of many children with autism.

I would also like Dr. Richard Smith for teaching me the elements of experimental research and professional development during my time at DSS.

I would like to thank Drs. Jesus Rosales-Ruiz and Joel Greenspoon for taking time to serve on my thesis committee and providing feedback that improved the overall quality of my thesis.

I would also like to thank Dr. Janet Ellis. Her advice and assistance have helped me accomplish many of my goals.

Finally, I owe my husband, Johnny Russo and my family my deepest gratitude for their emotional and financial support, without which my education would not have been possible.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

One of the defining characteristics of children with autism is a lack of social skills (American Psychiatric Association, 1994; Schreibman, 1988). The Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) describes social skills deficits as; difficulties engaging in nonverbal behaviors (e.g., eye contact, facial expressions, etc.) during social interactions, a failure to develop peer relationships, lack of social or emotional reciprocity, a failure to initiate to others, a failure to carry on a conversation, and the lack of pretend or imaginative play skills (American Psychiatric Association, 1994). Such deficits decrease the probability that children with autism will develop peer relationships and be able to successfully integrate into typical social environments. According to Shafer, Egel and Neef (1984) children with autism are not likely to acquire social skills or attend to the appropriate social cues (i.e., models, both verbal and physical) provided by peers, without systematic training to emit these behaviors.

Over the years, researchers (Coe, Matson, Craigie & Gossen, 1991; Goldstein & Cisar 1993; Gunter, Fox, Brady, Shores & Cavanaugh, 1988; Kamps, Leonard, Vernon, Dugan, Delquadri, Gershon, Wade & Folk, 1992; Koegel, Koegel, Hurley & Frea, 1992; Kohler, Strain & Shearer, 1992; Krantz & McClannahan, 1993; McGee, Almeida, Sulzer-Azaroff & Feldman, 1992; Taylor & Levin, 1997; Zanolli, Daggett & Adams, 1996) have utilized various techniques (i.e., self-management, peer training, integrated social groups, script training, and a tactile prompting device) to facilitate and expand the social behavior of children with autism. Typically, these techniques have been either adult or peer-

mediated in that an adult and/or peer is present to prompt and reinforce the social behaviors of the target child and their peers. In peer-mediated interventions, normally developing peers are trained to initiate (e.g., offer toys, gain child's attention, suggest play ideas, model play behaviors, etc) interactions with children with disabilities. Although these interventions are implemented by peers, teachers are initially present to train target behaviors, to prompt the target child to emit social behaviors, or to prompt a peer to begin a social exchange with the target child. In adult-mediated interventions, children with disabilities are trained to initiate interactions with their typically developing peers.

Although these procedures have been effective in facilitating initial increases in the targeted social responses, several problems arise. The constant presence of an adult to facilitate interactions is impractical and does not resemble normal childhood interactions (Walker, Greenwood, Hops & Todd, 1979). It is possible that teacher prompts may disrupt ongoing interactions between the target child and a peer (Strain & Fox, 1981). Furthermore, the teachers' verbal prompt and physical presence within the activity may serve as a cue or discriminative stimulus for social interaction. That is, if the teacher is present when interactions occur and the teacher delivers praise or a tangible consequence for interactions, interactions may be less likely to occur when the teacher is not present. In a review of the literature (Odom, Hoyson, Jamieson and Strain, 1985), found that 30-40% of peer initiations were prompted by the teacher and when prompts were removed social initiations and interactions decreased.

Several researchers (Goldstein & Cisar, 1994; Krantz & McClannahan, 1993) have investigated the effects of a less obtrusive prompt, social scripting procedures. Krantz and McClannahan utilized a scripting procedure to teach children with autism to emit statements about recently completed, current, and future activities. During play activities the children were prompted to read the statements to one another. Scripts were faded from the end to the beginning, by removing the last 3-4 words from the statements. Although the results showed increases in the number of scripted and unscripted initiations emitted by the children, the scripts were never completely faded. In a similar study, Goldstein and Cisar (1993) used scripts to increase the rate of theme-related social behavior (i.e., circus, pet shop, and carnival). Scripts consisted of three roles (e.g., ticket taker), consisting of reciprocal verbal and physical exchanges. The teacher modeled theme-related behaviors, provided verbal instructions, and reminders throughout the training of the script. When the scripts were removed, results showed increases in theme-related social behavior across all subjects.

A more discrete and less obtrusive prompt is the tactile prompting device. Taylor and Levin (1998) utilized a tactile prompting device, resembling a beeper, to teach a child to emit statements about play materials (e.g., “Look at this truck”, “I’m making a tiger”). First, the child was physically prompted to place his hand on the device. When the device was activated (fixed-time 60s), the child was prompted to turn to his teacher and emit a statement about the play materials on the table. Prompts were faded, using a most-to-least prompting hierarchy, until the child made a verbal statement each time the device

was activated. Next, the child was taught to emit statements when the device was in his/her pocket. The experimenters compared the number of verbal statements emitted by the subject across three conditions; no prompt, verbal prompt only and tactile prompt only. Results yielded increases in verbal statements only in the tactile prompt condition.

Subsequently Watts (1999) examined the effects of combining the tactile prompting device (RCT) and script cards to teach a child with autism to initiate six different activities. No pre-training was conducted in order for the child to wear the RCT around his waist. In RCT training, the RCT was activated for 3 s and a script card, containing one of five initiation statements, was turned over. Using a time-delay, the therapist prompted the child to read the script card. The therapist and child then engaged in whatever initiation statement (e.g., “let’s write”, “let’s read a book”, “let’s play a game”, etc.) was read by the child. The child was trained to initiate five statements in five different locations in the child’s bedroom (e.g., table, bookshelf, shelve with games, etc.), and the sixth location (i.e., middle of the room) was used as a generalization probe. Results showed increases in the number of unprompted (i.e., prior to activation of the RCT) initiation statements emitted by the child. Also, when the RCT was removed the number of unprompted initiations remained the high.

Results from the RCT studies (Taylor & Levin, 1998; Watts, 1999) suggest that there may be several advantages to using a tactile prompt to promote social interactions with children with autism: (1) it appears to be unobtrusive, (2) it may eliminate the problems associated with adult/peer-mediated contingencies, (3) control can be

transferred from the teacher or scripts to the device, (4) can be used for a variety of responses and (5) the RCT can be faded out.

The above procedures were effective in increasing the social behavior of children with autism; however, with the exception of Watts (1999). Training was conducted in restricted environments that were specifically designed to provide reinforcement for highly defined response classes. Such training provides the child with specific behaviors to emit in specific situations; however, these behaviors do not necessarily provide them with the skills appropriately and/or enter into novel situations.

In discussions of behavioral traps, Odom and McConnell (1992) and Baer and Wolf (1970) suggested that social skill training should occur in the environments where these behaviors are expected to occur, that the interactions between children with autism and their peers should be mutually reinforcing, and that the targeted social behaviors change over time in ways that are similar to peers. Accordingly, the desired outcome of successful intervention should be to produce entry behaviors to a number of behavioral traps (i.e., communities of reinforcement that maintain such behaviors). Furthermore, the behavior change should optimally produce cusps. That is, a behavior change that introduces the child to shaping environments that expand the child's repertoire in detail and scope over time (Baer & Wolf, 1970; Rosales-Ruiz & Baer, 1997).

A possible entry response may be to teach a child to recruit assistance and/or models from peers/teachers. Such a response may provide the child access to environments that expand his/her social skills and relationships. Several researchers have

evaluated procedures to teach children to recruit praise and reinforcement (Cantor & Gelfand, 1977; Stokes, Fowler & Baer, 1978); to recruit evaluations of their work (Seymour & Stokes, 1976); and to modify the frequency of positive and negative comments made by teachers. Although investigators have been successful in teaching children to recruit praise, attention and/or models in work and academic situations, research has not examined this phenomenon with respect to social settings and peer interactions.

In summary, the stimulus control, the range of topographies, and the generality of procedures appear to be critical issues in the development and evaluation of social skills interventions. Thus, the purpose of the present experiment was to address two questions related to these issues. First, can an intervention package containing tactile, gestural and textual prompts be utilized to prompt requesting behavior in a child with autism? Second, how would these manipulations affect the duration of interactive play, the number of play theme and play action topographies and the number of typical and atypical statements?

METHOD

Participant

The participant was a 6-year-old male who met the DSM-IV diagnostic criteria for autism. The child had been receiving behavior analytic in-home training for 3 years. His verbal skills at the onset of the study were slightly delayed. He could speak in complete sentences; however, sentence construction, comprehension and abstract reasoning were documented deficits. He read on a third-grade level and his mathematical skills were at a second-grade level. At the time of the study he received about 6 hours per week of in-home training with a teaching emphasis on skills such as: language, fine and gross motor movements, play, social, academic and self-help. He also attended a private, half-day, kindergarten program.

The child's parents, therapists, and teachers all reported a severe lack of interactive play skills across several settings (e.g., home therapy sessions, peer play times and school). The child frequently engaged in solitary play for long periods of time. When peers, teachers and/or parents attempted to engage in interactive play, the child would either ignore all models and/or prompts, both verbal and physical, or imitate a portion of the model/prompt and then re-engage in the previous solitary play routine.

Apparatus

A custom built remote controlled tactile prompt (RCT), similar in function and composition to a beeper, was utilized. The RCT was a 2 x 4-inch vibrating device that the child wore around his waist. The device contained a battery-powered motor that was

controlled by a Nikko R/C Systems Full Function. It was activated by a lever press on a 27 MHz remote control. The remote system allowed the experimenter to control the duration and timing of the vibration. The remote control had a working range of 25 feet. That is, the experimenter could control the duration and timing of the prompt from up to 25 feet.

The child participated in a previous study in which the RCT was used to prompt social initiations (e.g., “Let’s play with cars”, “Let’s play a game”, “Let’s read a book”, “Let’s write”, etc.) in the presence of stimulus materials (e.g., cars, games, books) (Watts, 1999).

Setting and Materials

The study was carried out in the child's bedroom, which contained a bed, a table with two chairs, three bookcases with books, and educational and play materials. For a complete diagram of the room see the Appendix A.

The stimulus materials utilized in this study were only available to the child during sessions. They consisted of three play activities: 1) Robin Hood’s Forest ™ which included five figures, two boulders, four arrows, two snakes, a ladder and an apparatus to shoot the boulders and arrows; 2) a castle which included eight figures, two cannonballs, and a table; and 3) a ship which included two torpedoes, an octopus, a detachable submarine car, a cage, and one figure. Two 3 x 5 orange note cards with one of two written phrases (i.e., “How can we play with this today?” and “How else can we play with this?”) were also utilized.

Dependent Variables

The experimenter scored the number of play actions, the number of verbal statements, the number of scripted and unscripted play requests, the number of gestural and textual prompts, and the duration of interactive play for each session. Appendix B contains the entire observation code, scoring protocols, and data sheet for all measures.

Interactive play was defined as joint attention (i.e., the teacher and child were facing the play materials or each other), having a play theme (e.g., pretending to save the princess from a dragon), two or more verbal exchanges between the child and teacher within the context of the play theme; and two or more physical exchanges between the child and the teacher within the context of the play theme.

The duration of interactive play was recorded with either a stopwatch or timer. The onset of interactive play was signaled by either; (1) the teacher emitted an initiation statement such as, “let’s pretend to sink the ship”, or (2) the child emitted an initiation statement such as, “let’s have a cannonball race” or “pretend it’s raining”. The offset of interactive play was signaled by 1 minute without a verbal and/or physical exchange following the initial criteria to qualify as interactive play. If two or more physical and verbal exchanges did not occur within 1 minute the timer was stopped and this would not be scored as interactive play.

Play actions were defined as any manipulation of the stimulus materials (e.g., shooting a cannonball, locking a figure in the dungeon, catching a fish on the ship, etc.).

Each play action was counted as a discrete event. For example, if the theme was fishing and the child threw the fishing rod in the water, hooked a fish, pulled it out of the water and cooked it, this sequence would be scored as 4 different play actions and not one sequence of actions.

Furthermore, the topography of play actions and the total number of new play actions (i.e., not emitted in prior sessions) emitted per session was recorded. For example, if in session one the child shot a knight with the arrow (one play action), then in session two the child dropped the knight in the dungeon and ran the knight over the moat (the cumulative number of play actions would be scored as three).

Scripted requests for instruction were defined as one of two verbal statements, "How can we play with this today?" and "How else can we play with it?" in which the child asked the teacher to model or describe play actions with the stimulus materials. These questions were written on the orange note cards.

Unscripted requests for instruction were defined as any verbalization, other than the two scripted requests, in which the child asked the teacher to model or describe play behaviors with the stimulus materials (e.g., "How does this work?", "What can we do with this?", etc.).

Typical statements were defined as any verbalization in which the child labeled an action (i.e., either an on-going, past and/or upcoming play action) within the context of play. This does not include bizarre or out of context statements. See Appendix B for examples.

Atypical statements were defined as any bizarre or out of context verbalization. See Appendix B for examples.

Interobserver Agreement

A second observer independently scored 40% of baseline and intervention sessions for all measures (i.e., play actions, typical/atypical statements, and requests for instruction, number of gestural prompts and the duration of interactive play) from videotaped recordings of the sessions. Percentage agreement for duration was calculated by dividing the shorter duration by the longer duration and multiplying by 100. Agreement for all other measures was scored only if both observers scored the occurrence of the targeted behaviors in the same sequence. Interobserver agreement was calculated by dividing the total number of agreements by the number of agreements plus the disagreements and multiplying by 100. See Table 1 for breakdown of agreement on each dependent measure.

Procedure

Baseline. Baseline sessions were conducted 2 days/week after school and consisted of three 5-min play segments with each set of stimulus materials. The order of presentation for the stimulus materials was randomly selected each day with the following criteria: (1) no two consecutive days started with the same stimulus materials and (2) the order of presentation of materials was not the same as the previous day.

Baseline sessions were carried out by the principal investigator in the child's bedroom. Each segment started when the therapist placed one set of stimulus materials (e.g., castle) on the floor between the child and the therapist said, "let's play" and set a timer for 5 min. The therapist remained next to the stimulus materials throughout the session. The therapist responded to any verbal and physical exchanges emitted by the child. The therapist, however, did not prompt/model or instruct the child's activities during this phase. The therapist modeled play behaviors (e.g., how to swing figures when playing with Robin Hood's Forest $_{TM}$) only following a verbal request from the child to do so. The therapist only engaged in interactive play when the child verbally initiated such play (e.g., if the child stated, "Let's have a boulder race" when playing with Robin Hood's Forest $_{TM}$). If the child did not initiate interactive play, request instruction, and/or direct any verbal statements to the therapist, the therapist remained next to the materials but did not manipulate any of the stimulus materials and did not initiate any verbal exchanges. When the five minutes had elapsed the therapist said, "It's time to clean up", and prompted the child to help remove the stimulus materials. This procedure was repeated for the next two sets of stimulus materials.

Intervention 1. Training was conducted in the child's bedroom. The child wore the RCT around his waist throughout training. Because the child had a prior learning history with the RCT no pre-training was required (Watts, 1999).

The session began when the therapist stated, "Let's play", the RCT was activated for 3 s and a written script card ("How can we play with this today?") was turned over.

The therapist prompted the child to read the card by pointing to the text on the script card. After the child read the card, the therapist described a play theme (e.g., with the ship present the therapist would say, “Let’s pretend to get ship wrecked on a desert island”) and then modeled several behaviors within the context of the play theme (e.g., the ship sinking and the figures swimming to life boats, the figures throwing their belongings into the life boats, etc.). The therapist responded to all verbal (i.e., comments describing play actions, play suggestions) and physical exchanges emitted by the child. After 2 min of interactive play elapsed, the therapist activated the RCT for 3 s and turned over the second written script card (“How else can we play with this?”) and prompted the child to read the card by pointing to the text on the script card. After the child read the card, the therapist described a new play theme (e.g., pretending to take scuba divers out on the ship) and then modeled several behaviors within the context of the new play theme (e.g., putting air tanks on the figures, having the figures jump into the water, etc). When 5 min had elapsed from the start of the session (i.e., “Let’s play”), the therapist said, “It’s time to clean up”, and prompted the child to help remove the stimulus materials. The next set of stimulus materials was presented and the same procedure was followed until all three sets of stimulus materials were presented. See Table 2 for the order of material presentation per session.

The proximity of the written script cards, to the child and therapist, was gradually faded. The criteria to begin fading was the emission of one unprompted scripted request, and was determined on a session by session basis. First, the RCT was activated, if the

child did not emit the scripted request, the therapist pointed to the card. Next, the therapist began gradually moving the proximity of the card from the child, 4 inches at a time. If the child did not emit a request for instruction following the activation of the RCT, the therapist pointed to the script card and waited for the child to either turn the card over and read the written phrase or to verbalize the statement on the card. See Appendix A for a diagram of the room and fading procedure.

RCT Only. The setting remained the same as in baseline and the first intervention. The child and therapist sat on the floor of the child's bedroom with one set of stimulus materials present and the teacher said, "let's play" and activated the RCT for 3 s. The therapist responded to all verbal (i.e., comments describing play actions, play suggestions) and physical exchanges emitted by the child. The therapist only engaged in interactive play when the child verbally initiated such play. If the child did not initiate interactive play (i.e., suggest a play theme), request instruction, and/or direct any verbal statements to the therapist, the therapist remained next to the materials but did not manipulate any of the stimulus materials and made no verbal initiations to play. After 2 min of interactive play or 2 min of the session elapsed, the therapist activated the RCT for 3 s. When the five minutes elapsed the therapist said, "It's time to clean up", then the child and therapist removed the materials. This procedure was repeated for the next two sets of stimulus materials.

Intervention 2. The procedure was the same as the first intervention with the exception that the therapist no longer responded to unscripted requests emitted by the child.

Experimental Design

The experimental design was a multiple baseline and reversal across the three sets of stimulus materials (i.e., ship, castle and Robin Hood's Forest $_{TM}$). The sequence of conditions were A-B-A-C-D, with phase A consisting of an initial baseline. Phase B included the training of the RCT prompt and note cards containing two written phrases designed to occasion requests for instruction. Phase B was first implemented with the ship, then the castle, and finally, Robin Hood's Forest $_{TM.}$ A second baseline was implemented simultaneously across the three sets of stimulus materials. Phase C consisted of the RCT only and was implemented simultaneously across the three sets of stimulus materials. Phase D also utilized the RCT prompt and written script cards; however, in this phase the experimenter did not respond to play suggestions emitted by the child. The criteria to change phases was stable rates of responding across all measures (i.e., duration of interactive play, number of play actions, number of statements, number of requests for instruction and the cumulative number of play actions) as determined by visual inspection of graphically displayed data.

It should be noted that, in the initial three sessions of phase B with the ship it is plausible that the RCT malfunctioned. The child did wear the RCT and it appeared to be effective in the sessions; however, after investigation the experimenter determined the

vibrating mechanism was not functioning. Following identification of the malfunction, the experimenter immediately repaired the RCT apparatus. Also, the videotapes of the third and fourth sessions of phase B with the ship were destroyed before the experimenter scored them.

RESULTS

Figure 1 shows the duration of interactive play during all conditions of the experiment across the three play activities (i.e., ship, castle and forest, respectively). The top portion of Figure 1 displays the duration of interactive play in each session with the ship. The arrows indicate when the experimenter began fading the written script cards and when the cards were completely faded. During baseline, the duration of interactive play remained variable and averaged 10 s (range, 0 - 67 s). After Intervention 1 was implemented, the duration of interactive play immediately increased to 300 s and remained at 300 s throughout the duration of this phase. During the return to baseline, the duration of interactive play began at 300 s and then became more variable, with an average of 164 s (range, 0 - 300 s). In the RCT Only condition, the duration of interactive play immediately decreased to 0 s and remained at 0 s throughout the duration of this phase. After Intervention 2 was implemented, the duration of interactive play immediately increased to 300 s and remained at 300 s throughout the duration of the phase.

The middle portion of Figure 1 displays the duration of interactive play in each session with the castle. During baseline, the duration of interactive play initially remained constant at 0 s. Then, corresponding to the implementation of intervention with the ship, the duration began to fluctuate with an average of 25 s (range, 0 - 171 s). After Intervention 1 was implemented, the duration of interactive play immediately increased to 300 s and remained at 300 s throughout the duration of this phase. During the return to

baseline, the duration of interactive play sharply decreased to 0 s and, following an initial increase, stabilized at 0 s. The average duration of interactive play was 50 s (range, 0 - 300 s). In the RCT Only condition, the duration of interactive play remained constant at 0 s. After Intervention 2 was implemented, the duration of interactive play immediately increased to 300 s and remained at 300 s throughout the duration of the phase.

The bottom portion of Figure 1 displays the duration of interactive play in each session with the forest. During baseline, the duration of interactive play initially remained constant at 0 s. Then, corresponding to the implementation of intervention with the ship durations began to fluctuate with an average of 69 s (range, 0 - 285 s). After Intervention 1 was implemented, the duration of interactive play immediately increased to 300 s and remained at 300 s throughout the duration of this phase. During the return to baseline, the duration of interactive play immediately decreased to 0 s and then became more variable, with an average of 107 s (range, 0 - 300 s). In the RCT Only condition, the duration of interactive play remained variable, with an average of 121 s (range, 22 - 300 s). Once Intervention 2 was implemented, the duration of interactive play immediately increased to 300 s and remained at 300 s throughout the duration of the phase.

Figure 2 shows the cumulative number of different play theme topographies across the three play activities (i.e., ship, castle and forest, respectively). The top portion of Figure 2 displays the cumulative number of different play theme topographies emitted in each session with the ship. The closed circles indicate the number of recruited play theme topographies and the open circles indicate the number of non-recruited play theme

topographies emitted by the child. The arrows indicate when the experimenter began fading the written script cards and when the cards were completely faded.

During baseline the cumulative number of recruited play theme topographies remained constant at 0 throughout the duration of the phase, whereas the cumulative number of non-recruited play themes increased very slightly (range, 0 - 2). After Intervention 1 was implemented, the cumulative number of recruited play themes showed a continual increase throughout the phase (range, 3 - 46), while the cumulative number of non-recruited play themes remained stable with a range of 2 to 4. During the return to baseline, the cumulative number of recruited and non-recruited play themes remained stable, with ranges of 45 to 46 and 4 to 6, respectively. In the RCT Only condition, the cumulative number of recruited and non-recruited play themes remained constant at 46 and 6, respectively. After Intervention 2 was implemented, the cumulative number of recruited play themes showed a continual increase throughout the phase (range, 48 - 70), while the cumulative number of non-recruited play themes remained constant at 6.

The middle portion of Figure 2 displays the cumulative number of different play theme topographies emitted in each session with the castle. During baseline, the cumulative number of recruited play theme topographies initially remained constant at 0 then increased to 1. The cumulative number of non-recruited play themes initially remained stable; then, corresponding to the implementation of intervention with the ship, non-recruited play themes began to gradually increase with a range of 0 to 6. After the first intervention was implemented, the cumulative number of recruited play themes

showed a continual increase throughout the phase (range, 3 - 17), while the cumulative number of non-recruited play themes remained stable with a range of 6 to 7. During the return to baseline, the cumulative number of recruited play themes remained constant at 17, while the number of non-recruited play themes increased slightly (range, 7 - 8). In the RCT Only condition, the cumulative number of recruited and non-recruited play themes remained constant at 17 and 8, respectively. After Intervention 2 was implemented, the cumulative number of recruited play themes immediately increased and continued to increase throughout the phase (range, 19 - 38), while the cumulative number of non-recruited play themes remained constant at 9.

The bottom portion of Figure 2 displays the cumulative number of different play theme topographies emitted in each session with the forest. During baseline, the cumulative number of recruited play theme topographies initially remained constant at 0, then gradually increased to 7. The cumulative number of non-recruited play themes initially remained stable; then, corresponding to the implementation of intervention with the ship, non-recruited play themes began to gradually increase with a range of 0 to 8. After Intervention 1 was implemented, the cumulative number of recruited play themes showed a continual increase throughout the phase (range, 9 - 13), while the cumulative number of non-recruited play themes remained stable, with a range of 8 to 9. During the return to baseline, the cumulative number of recruited and non-recruited play themes remained stable, with ranges of 13 to 16 and 9 to 12, respectively. In the RCT Only condition, the cumulative number of recruited and non-recruited play themes remained

stable, with ranges of 16 to 17 and 13 to 14, respectively. After Intervention 2 was implemented, the cumulative number of recruited play themes showed a continual increase throughout the phase (range, 18 - 40), while the cumulative number of non-recruited play themes remained constant at 14.

Figure 3 shows the cumulative number of different play action topographies across the three play activities (i.e., ship, castle and forest, respectively). The top portion of Figure 3 displays the cumulative number of different play action topographies emitted in each session with the ship. The closed circles indicate the number of recruited play action topographies and the open circles indicate the number of non-recruited play action topographies emitted by the child. The arrows indicate when the experimenter began fading the written script cards and when the cards were completely faded.

During baseline, the cumulative number of recruited and non-recruited play actions ranged from 5 to 12 and 12 to 19, respectively. After Intervention 1 was implemented, the cumulative number of recruited play actions showed a continual increase throughout the phase (range, 17 - 120), while the cumulative number of non-recruited play actions initially increased and then remained stable, with a range of 21 to 36. During the return to baseline, the cumulative number of recruited and non-recruited play actions remained stable, with ranges of 123 to 124 and 36 to 40, respectively. In the RCT Only condition, the cumulative number of recruited play actions remained constant at 124, while the number of non-recruited play actions increased slightly (range, 42 - 44). After Intervention 2 was implemented, the cumulative number of recruited play actions

showed a continual increase throughout the phase (range, 131 - 163), while the cumulative number of non-recruited play actions remained stable, with a range of 44 to 48.

The middle portion of Figure 3 displays the cumulative number of different play action topographies emitted in each session with the castle. During baseline, the cumulative number of recruited and non-recruited play action topographies initially remained stable; then, corresponding to the implementation of intervention with the ship, the number of recruited and non-recruited play actions began to gradually increase with ranges of 8 to 10 and 3 to 22, respectively. After Intervention 1 was implemented, the cumulative number of recruited play actions showed a continual increase throughout the phase (range, 13 - 46), while the cumulative number of non-recruited play themes gradually increased with a range of 22 to 32. During the return to baseline, the cumulative number of recruited play actions remained constant at 46, while the number of non-recruited play actions increased slightly (range, 33 - 44). In the RCT Only condition, the cumulative number of recruited play actions remained constant at 46, while the number of non-recruited play actions increased slightly (range, 44 - 47). After Intervention 2 was implemented, the cumulative number of recruited play actions immediately increased and continued to increase throughout the phase (range, 50 - 83), while the cumulative number of non-recruited play themes remained stable (range, 47 - 50).

The bottom portion of Figure 3 displays the cumulative number of different play action topographies emitted in each session with the castle. During baseline, the cumulative number of recruited and non-recruited play action topographies initially remained stable; then, corresponding to the implementation of intervention with the ship, the number of recruited and non-recruited play actions began to gradually increase with ranges of 6 to 28 and 5 to 50, respectively. After Intervention 1 was implemented, the cumulative number of recruited play actions showed a continual increase throughout the phase (range, 32 - 42), while the cumulative number of non-recruited play themes remained stable (range, 52 - 53). During the return to baseline, the cumulative number of recruited and non-recruited play actions remained stable, with ranges of 42 to 49 and 55 to 57, respectively. In the RCT Only condition, the cumulative number of recruited and non-recruited play actions remained stable, with ranges of 49 to 53 and 57 to 58, respectively. After Intervention 2 was implemented, the cumulative number of recruited play actions showed a continual increase throughout the phase (range, 54 - 91), while the cumulative number of non-recruited play themes remained stable (range, 59 - 68).

Figure 4 shows the number of typical and atypical statements emitted by the child across the three play activities (i.e., ship, castle and forest, respectively). The closed circles indicate the number of typical statements and the open circles indicate the number of atypical statements emitted by the child. The arrows indicate when the experimenter began fading the written script cards and when the cards were completely faded. The top

portion of Figure 4 displays the number of typical and atypical child statements emitted in each session with the ship.

During baseline, the number of typical statements was higher than atypical statements and averaged of 10 per session (range, 5 - 12). The number of atypical statements remained stable, with an average of .6 per session (range, 0 - 2). When Intervention 1 was implemented, the number of typical statements initially decreased, and then began to fluctuate with an average of 10 per session (range, 6 - 17), while the number of atypical statements remained stable with an average of .4 per session (range, 0 - 5). During a return to baseline, the number of typical statements initially decreased then began to increase with an average of 15.5 per session (range, 9 - 20). The number of atypical statements initially remained at 0 then slightly increased with an average of 1.3 per session (range, 0 - 6). In the RCT Only condition, the number of typical statements initially increased then began to decrease with an average of 19 per session (range, 14 - 21). The number of atypical statements initially decreased to 0 and then began to fluctuate with an average of 2 per session (range, 0 - 4). When Intervention 2 was implemented, the number of typical statements initially decreased and began to fluctuate with an average of 12.8 per session (range, 9 - 19). The number of atypical statements immediately decreased and remained constant at 0 throughout the duration of the phase.

The middle portion of Figure 4 displays the number of typical and atypical child statements emitted in each session with the castle. During baseline, the number of typical statements was higher than atypical statements and remained variable throughout the

duration of the condition with an average of 13.5 per session (range, 1 - 26); however, there was a slight increase corresponding to implementing Intervention 1 with the ship. The number of atypical statements initially remained stable; then, corresponding to the implementation of Intervention 1 with the ship, typical statements became variable with an average of 1.1 per session (range, 0 - 2). When Intervention 1 was implemented, the number of typical statements initially decreased, and then began to fluctuate with an average of 7.2 per session (range, 2 - 12), while the number of atypical statements remained stable with an average of .1 per session (range, 0 - 1). During a return to baseline, the number of typical statements initially increased then began to fluctuate with an average of 22.8 per session (range, 15 - 36). The number of atypical statements initially increased then stabilized with an average of 1.5 per session (range, 1 - 6). In the RCT Only condition, the number of typical statements initially increased then began to fluctuate with an average of 22.3 per session (range, 16 - 29). The number of atypical statements initially increased and continued to increase with an average of 3.6 per session (range, 1 - 6). When Intervention 2 was implemented, the number of typical statements initially decreased, and then began to fluctuate with an average of 10.2 per session (range, 6 - 16). The number of atypical statements immediately decreased and remained at 0 throughout the duration of the phase.

The bottom portion of Figure 4 displays the number of typical and atypical child statements emitted in each session with the forest. During baseline, the number of typical statements was higher than atypical statements and averaged of 12.8 per session (range, 5

- 32); however, there was a slight increase corresponding to implementing Intervention 1 with the ship. The number of atypical statements initially remained stable then corresponding to the implementation of Intervention 1 with the ship became variable with an average of .9 per session (range, 0 - 5). When Intervention 1 was implemented, the number of typical statements initially decreased, and then began to increase with an average of 15.75 per session (range, 12 - 20), while the number of atypical immediately decreased to 0 and remained constant at 0 throughout the phase. During a return to baseline, the number of typical statements varied with an average of 17.8 per session (range, 8 - 35). The number of atypical statements initially increased and varied with an average of 2.1 per session (range, 0 - 6). In the RCT Only condition, the number of typical statements immediately decreased and showed a continual decrease with an average of 19.3 per session (range, 17 - 21), while the number of atypical statements immediately decreased, and then began to increase, with an average of 2.6 per session (range, 1 - 6). When Intervention 2 was implemented, the number of typical statements initially decreased and varied with an average of 12.3 per session (range, 7 - 19). The number of atypical statements immediately decreased and remained constant at 0 throughout the duration of the phase.

Figure 5 shows teacher responding in relation to the number of scripted and unscripted requests for instruction emitted by the child. The top portion of Figure 5 indicates the number of scripted and unscripted requests the teacher responded to and the number of unscripted requests the teacher did not respond to in each session with the

ship. The arrows indicate when the experimenter began fading the written script cards and when the cards were completely faded.

During baseline, the number of scripted and unscripted requests the teacher responded to and did not respond to remained constant at 0. The number of unscripted requests the teacher responded to averaged .36 per session (range, 0 - 1). After Intervention 1 was implemented, the number of scripted requests responded to by the teacher immediately increased and averaged 2.2 per session (range, 1 - 4). The number of unscripted requests the teacher responded to initially increased and averaged .13 per session (range, 0 - 1). The number of unscripted requests the teacher did not respond to remained at 0 during this phase. During the return to baseline, the number of scripted requests the teacher responded to immediately decreased then began to fluctuate before stabilizing at 0, with an average of .33 per session (range, 0 - 1). The number of unscripted requests the teacher responded to remained stable with an average of .5 per session (range, 0 - 3), and the number of unscripted requests the teacher did not respond to remained constant at 0. In the RCT Only condition, the number of scripted requests, unscripted requests the teacher responded to and unscripted requests the teacher did not respond to remained at 0. When Intervention 2 was implemented, the number of scripted requests the teacher responded to immediately increased and averaged 2 per session, while the number of unscripted requests the teacher responded to remained at 0. However, the number of unscripted requests the teacher did not respond to immediately increased and averaged .15 (range, 0 - 1).

The middle portion of Figure 5 indicates the number of scripted and unscripted requests responded to by the teacher and the number of unscripted requests not responded to by the teacher in each session with the castle. During baseline, the number of scripted requests the teacher responded to remained stable, with an average of .04 per session (range, 0 - 1), and the number of unscripted requests the teacher did not respond to remained at 0. However, the number of unscripted requests the teacher responded to increased corresponding to the implementation of Intervention 1 with the ship (range, 0 to 2). After Intervention 1 was implemented, the number of scripted requests responded to by the teacher immediately increased and remained at 2 per session. The number of unscripted requests the teacher responded to remained stable, with an average of .11 per session (range, 0 - 1), and the number of unscripted requests the teacher did not respond to remained at 0. During the return to baseline, the number of scripted requests the teacher responded to immediately decreased and remained at 0. The number of unscripted requests the teacher responded to remained stable, with an average of .16 per session (range, 0 - 1), and the number of unscripted requests the teacher did not respond to remained at 0. In the RCT Only condition, the number of scripted requests, unscripted requests the teacher responded to and unscripted requests the teacher did not respond to remained at 0. When Intervention 2 was implemented, the number of scripted requests the teacher responded to immediately increased and remained stable, with an average of 2 per session, and the number of unscripted requests the teacher responded to remained at

0. However, the number of unscripted requests the teacher did not respond to increased then stabilized with an average of .3 (range, 0 - 1).

The bottom portion of Figure 5 indicates the number of scripted and unscripted requests responded to by the teacher and the number of unscripted requests not responded to by the teacher in each session with the forest. During baseline, the number of scripted requests the teacher responded averaged .3 per session (range, 0 - 2), while the number of unscripted requests the teacher did not respond to remained at 0. However, the number of unscripted requests the teacher responded to fluctuated with an average of .36 per session (range, 0 - 1). After Intervention 1 was implemented, the number of scripted requests responded to by the teacher immediately increased, with an average of 1.75 per session (range, 0 - 2). The number of unscripted requests the teacher responded to, immediately decreased and averaged .25 per session (range, 0 -o 1). The number of unscripted requests the teacher did not respond to remained at 0. During the return to baseline, the number of scripted requests the teacher responded to averaged .5 per session (range, 0 - 1). However, the number of unscripted requests the teacher responded to remained stable, with an average of .16 per session (range, 0 - 1), and the number of unscripted requests the teacher did not respond to remained at 0. In the RCT Only condition, the number of scripted and unscripted requests the teacher responded to averaged .33 and .66, respectively (ranges, 0 - 1). The number of unscripted requests the teacher did not respond to remained at 0. When Intervention 2 was implemented, the number of scripted requests the teacher responded to immediately increased and averaged

1.8 per session (range, 0 - 1). The number of unscripted requests the teacher responded to remained at 0, while the number of unscripted requests the teacher did not respond to increased and averaged .4 (range, 0 - 2).

Figure 6 shows the number of textual and gestural prompts the teacher utilized to facilitate use of the scripted phrases across the three play activities (i.e., ship, castle and forest; respectively). The top portion of Figure 6 displays the number of textual and gestural prompts emitted by the teacher within the context of the ship. The closed circles depict the textual prompts and the open circles depict the gestural prompts. The arrows indicate when the experimenter began fading the written script cards and when the cards were completely faded. During baseline, the number of textual and gestural prompts remained at 0. After Intervention 1 was implemented, the number of both textual and gestural prompts immediately increased and fluctuated throughout the condition with averages of 1.7 and 1.4, respectively. In the return to baseline, the number of textual and gestural prompts immediately decreased and remained at 0 throughout this phase and the RCT Only phase. When Intervention 2 was implemented, the number of textual and gestural prompts immediately increased and averaged .6 and .4, respectively. During the last three sessions, the number of textual and gestural prompts remained at 0.

The middle portion of Figure 6 indicates the number of textual and gestural prompts emitted by the teacher within the context of the castle. During baseline, the number of teacher prompts remained at 0. After Intervention 1 was implemented, the number of textual and gestural prompts immediately increased and fluctuated throughout

the condition with averages of .75 and .7, respectively. In the return to baseline, the number of both textual and gestural prompts immediately decreased and remained at 0 throughout this phase and the RCT Only phase. When Intervention 2 was implemented, the number of textual and gestural prompts increased and averaged 1 and .4, respectively. During the last three sessions, the number of textual and gestural prompts remained at 0.

The bottom portion of Figure 6 shows the number of textual and gestural prompts emitted by the teacher within the context of the forest. During baseline, the number of teacher prompts remained at 0. After Intervention 1 was implemented, the number of prompts immediately increased and averaged 1.25 and .75, respectively. In the return to baseline, the number of textual and gestural prompts immediately decreased and remained at 0 throughout this phase and the RCT Only phase. When Intervention 2 was implemented, the number of prompts increased and averaged .8 and .5, respectively. During the last three sessions, the number of textual and gestural prompts remained at 0.

DISCUSSION

This study evaluated the effects of utilizing the RCT as a prompt for requesting teacher models and suggestions. The results of this study showed increases in the number of requests for teacher models and suggestions (i.e., verbal and physical play actions and themes) were found across three different play activities. When intervention was implemented within each play context, the duration of interactive play, the number of play theme topographies, the number of play action topographies and the number of typical statements increased, while the number of atypical statements decreased.

Corresponding to the implementation of the first intervention with the ship, there were observable increases in the duration of engagement within the untrained play contexts (i.e., castle and forest). Interestingly, the child began spontaneously emitting unscripted and scripted requests for models and suggestions in both the castle and forest contexts. The unscripted requests, however, were often play themes that had been modeled within the context of the ship. This indicates that some generalization of this dependent measure occurred in the presence of the untrained materials. Consistent changes in any of the measures were not displayed with the castle and forest until the intervention was specifically applied within these two play contexts.

The results also indicated a decrease in the rate of typical comments emitted in intervention phases, compared to baseline and RCT Only phases. It is possible that

increases in number and duration of reciprocal exchanges (verbal and physical) decreased the number of opportunities the child had to emit statements (both typical and atypical) in the intervention phases. In the baseline and RCT Only phases, the experimenter only emitted verbalizations or physical exchanges following a verbal or physical exchange from by the child. If the child did not direct any verbalizations or physical exchanges to the experimenter, the experimenter simply sat and observed the child manipulating the play materials. Because exchanges were rarely reciprocal, in baseline and RCT Only conditions, the child had more opportunities to emit typical and atypical statements. During intervention phases, the experimenter provided both verbal and physical models in which the child responded, which increased the number and duration of reciprocal exchanges and decreased the number of opportunities the child had to emit typical and atypical statements.

In addition, the number of atypical statements emitted by the child occurred at low rates during the first intervention, and did not decrease to zero until the second intervention was implemented. Although, this decrease may seem insignificant, anecdotal evidence suggests that the emission of one atypical statement in a play situation was sufficient to terminate an interaction, particularly if the statement was bizarre. Thus, the ideal outcome is one in which the number of atypical statements remains at zero, as was the case in the second intervention.

It is plausible that increasing the child's repertoire (both verbally and physically) with respect to the number of play actions and play themes subsequently decreased the

number of atypical statements the child emitted. Anecdotal reports indicate that this child is more likely to emit atypical statements in the presence of novel materials and/or novel situations (i.e., untrained situations and/or materials as in baseline). Because in intervention phases, the experimenter and child engaged in numerous different play behaviors, it is possible the number of play actions and play themes in the child's repertoire increased. Thereby decreasing the probability that the child would emit atypical and bizarre statements.

The results also suggest that transferring control from a most-to-least prompting hierarchy was successful. That is, stimulus control over verbal requests for models and suggestions was transferred from a textual prompt (i.e., written script card) to a gestural prompt (i.e., finger point) and finally, to a less obtrusive prompt (i.e., the remote controlled tactile prompt). Interestingly, in the first intervention, stimulus control was not transferred from the gestural prompt to the RCT; however, in the second intervention, control was transferred. There are two possible accounts for the differences in intervention phases. First, it is possible that, in the first intervention, the RCT may have served two functions: (a) a prompt to emit a scripted request or (b) a prompt to emit an unscripted request. In the first intervention, the experimenter responded to all verbal statements emitted by the child (including unscripted requests for models or play suggestions). When the RCT was activated the child emitted either a scripted or an unscripted request and the experimenter responded to the request, whether it was scripted or unscripted. Because all requests were emitted after the RCT was activated, the RCT

served as a prompt to emit a request (i.e., either scripted or unscripted), but not specifically a scripted request. In the second intervention, however, the experimenter only responded to scripted requests for models. Thus, it is plausible that the RCT served only one function (i.e., a prompt to emit scripted requests) as opposed to multiple functions, as was the case in the first intervention. A second possibility is that the RCT did not initially exert any control over requests. Due to the limited number of pairings (i.e., 2 per session) in intervention phases, it is plausible that multiple pairings of the script and RCT were required to transfer stimulus control.

Similar to Taylor and Levin (1998) and Watts (1999), the RCT was effective in prompting the targeted behaviors. Table 3 includes detailed comparison of the present experiment with Taylor and Levin and Watts. Interestingly, these studies used different timings of the prompt delivery and different fading procedures to transfer the control to the RCT prompt. Taylor and Levin activated the RCT on a 1-min fixed-time interval regardless of the child's behavior, and utilized a most-to-least prompting hierarchy to fade teacher prompts. In Watts, the RCT was activated after 30s to 1-min without a verbal or physical exchanges between the child and the teacher. Watts also utilized a time-delay procedure to fade the script cards. In the present experiment, the RCT was activated based on the child's behavior (i.e., 2-min of interactive play or 1-min of solitary play) and the proximity of the script cards was faded. It is important to note that the RCT was faded in Watts. The primary concern, however, of the present experiment was

to increase targeted behaviors (i.e., requests for teacher models) and provide the therapist with a less obtrusive mechanism for prompting such behaviors.

The present findings, in conjunction with those found by Taylor and Levin (1998) and Watts (1999) have several implications for the analysis of both the training and maintenance of procedures designed to teach social skills to children with autism. All three studies suggest that utilizing the remote-controlled tactile prompt to facilitate peer interactions may eliminate some of the limitations commonly noted with adult and/or peer-mediated interventions (Strain & Fox, 1981; Walker, Greenwood, Hops & Todd, 1979). The RCT resembles a beeper, which is small enough to be unobservable under a child's shirt, so peers would not be aware of its existence. Because it can be activated from a distance of 25 ft and on a fixed and/or variable time schedule it eliminates the impracticality of the constant presence of an adult to prompt interactions. Additionally, disruptions by an adult (i.e., providing prompts and/or praise) during ongoing peer interactions, would decrease, thereby increasing the probability that the interactions would sustain over time and resemble normal childhood interactions. It has been suggested that during the course of normal interactions typically developing children will recruit models and suggestions from others in the environment (Graubard, Rosenberg, & Miller, 1991; Sherman & Cormier, 1974).

The present findings extend those of previous research designed to teach the children to recruit teacher models and suggestions (Cantor & Gelfand, 1977; Stokes, Fowler & Baer, 1978; Seymour & Stokes, 1976; Sherman & Cormier, 1974). This study

demonstrated the effectiveness of those procedures within the context of a play setting versus work or academic settings. Additionally, previous investigators have focused on directly teaching the child skills to engage in social situations (Goldstein & Cisar, 1992; and Krantz & McClannahan, 1993; Taylor & Levin, 1998). Teaching a child activity-specific play skills provides that child with a sufficient repertoire to emit similar behaviors in similar situations; however, it does not provide them with the skills necessary to successfully engage in novel situations. Teaching a child to request models and suggestions from others may provide them with the skills to enter novel situations, which will allow the child to learn from their peers without the intrusion of an adult modeling or prompting interactions. Requesting models and suggestions provides the child with access to expanded environments. Behavior is shaped and expanded within these environments, thereby constituting a behavioral trap and the acquisition of what might be considered a cusp (Baer & Wolf, 1970; Rosales-Ruiz & Baer, 1997).

To summarize, the findings of this study demonstrate that a remote controlled tactile device can be utilized as a prompt for recruiting social interactions (i.e., verbal and physical exchanges within the context of a play theme). The effectiveness of the RCT indicates that it may serve as a prompt for a number of responses in a number of situations. These outcomes notwithstanding, there are several aspects of this study that require additional analysis. The RCT is an extraneous prompt which, like all prompts, should be faded and stimulus control transferred from the prompt to stimuli occurring in the natural environment (Odom, Hoyson, Jamieson & Strain; 1985). Because the RCT

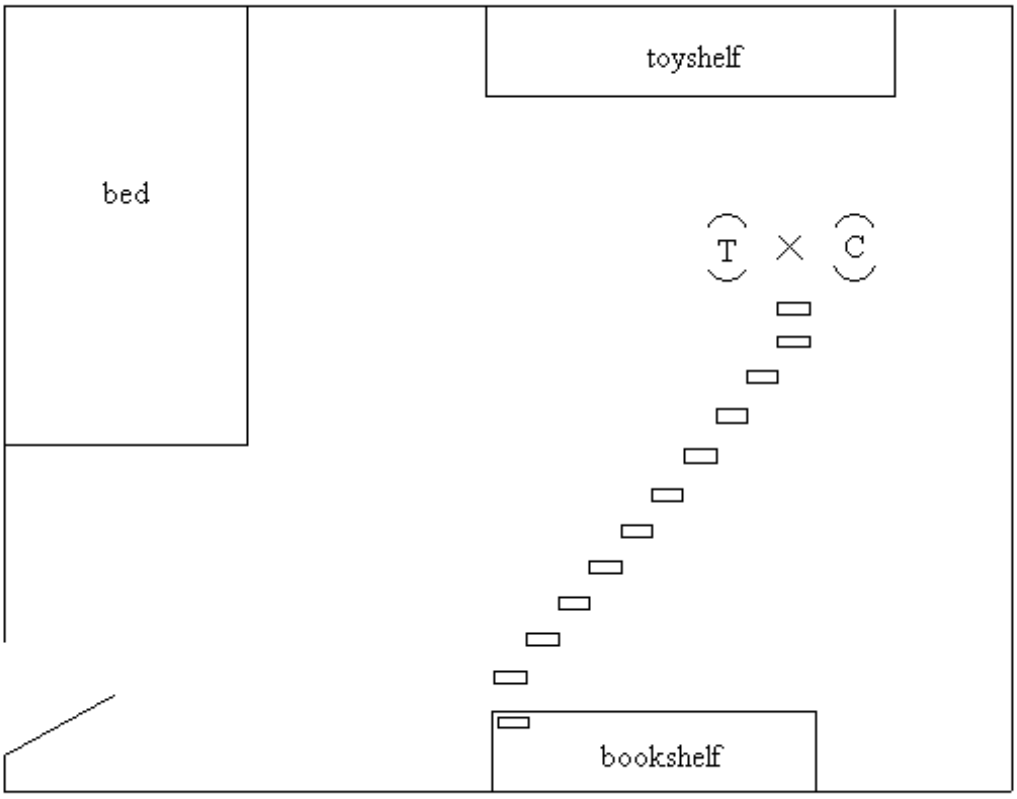
was not faded in the present experiment or previous research (Taylor & Levin, 1998), it is not possible to indicate the ease or difficulty of a fading procedure. Further research may identify ways to fade the tactile prompt and to transfer control to stimuli in the natural environment.

Additionally, due to the child's previous history with the RCT, the generality of findings are limited. It remains to be seen if this procedure would be effective as a prompt with other children. The RCT, if effective with other children, could prove to be a component in the prompting of not only social interactions, but also a number of responses in which stimulus control should be transferred to stimuli in the natural environment. Furthermore, research is warranted in examing the effectiveness of this procedure in social settings with typically developing peers.

APPENDIX A

ROOM DESIGN

ROOM DIAGRAM



T Teacher
C Child
X Toys

APPENDIX B

OBSERVATION CODE, PROTOCOLS AND DATA SHEETS

OBSERVATION CODE AND PROTOCOL

For each session you will score the number of play actions, the number of verbal statements, the number of scripted and unscripted play requests and the duration of interactive play.

Duration of interactive play defined as two or more verbal exchanges, between the child and teacher, within the context of the play theme; two or more physical exchanges, between the child and the teacher, within the context of the play theme

Example: Child says, "let's pretend to have a battle", teacher replies, "ok", child points to figures and says, "which one do you want?", teacher picks up a figure and says, "this one", the child picks up a figure and says, "on your mark, get set, go" and the teacher and child begin manipulating the figures to simulate a fight between the two figures.

Nonexample: Child says, "let's have a cannonball race", teacher replies "ok" the child picks up a cannonball and drops it down a hole in the forest, the teacher picks up a cannonball and drops it down the hole in the forest, the child repeats the behavior several times in succession.

Number of play actions defined as any manipulation of the stimulus materials.
Example: Shooting a cannonball or locking a figure in the dungeon.
Nonexample: Holding a figure in your lap or handing a figure to the teacher.

Number of scripted request for instruction defined as one of two verbal statements, "How can we play with this today?" and "How else can we play with it?"
Nonexample: "How does this work?" or "What does this do?"

Number of unscripted request for instruction defined as any verbalization in which the child asked the teacher to model or describe play behaviors with the stimulus materials

Example: “How does this work?” or “What does this do?”

Nonexample: “How can we play with this today?” and “How else can we play with it?”

Typical statements defined as any verbalization in which the child labels an action (i.e., either an on-going, past and/or upcoming play action) within the context of play. This does not include bizarre or out of context statements.

Atypical statements were defined as any bizarre or out of context verbalization.

Examples - Typical	Context
1. “Mark, get set, go”	Forest – cannonball race
2. “We’re not letting you out”	Castle – capture the king
3. “Everybody on board”	Forest – magic carpet
4. “I got all the jewels”	Ship – find treasure
5. “Get horses to climb up steps”	Castle – training horses

Examples - Atypical	
1. “Cracked his head open on a trash ball”	Castle – figures fighting
2. “Only do it for doors”	Ship – catching the enemies
3. “Oklahoma jail school”	Castle – knock figures down
4. “He’s gonna put you in open”	Castle – figures in dungeon
5. “When snakes come it blasts right in the air”	Forest - robbery

RECORDING PROTOCOL

Play actions, statements and requests are all scored following each occurrence and in the sequence in which they occur. For example, when scoring play actions, the child swings a figure then throws an arrow so you color in the box in the first column next to swing figure then color in box in second column next to throw arrow.

Scoring duration of interactive play – begin the stopwatch/timer when either; 1) teacher emits initiation such as, “let’s pretend to …”, or 2) the child emits an initiation phrase such as, “let’s pretend to …” or “let’s play …”. If two or more verbal and physical exchanges do not occur within 1 minute stop timer and reset. This would not be scored as interactive play.

DATA SHEET

Ship

Session _____

Date _____

Observer _____

Phase _____

Duration

start				
stop				

Rate

sound effects																							
Laughing																							
Singing																							
Noises																							

Unscripted requests for instruction																							

Scripted requests for instruction																							
how can we …																							
how else can …																							

Suggestion for play																							

Statements																							

play actions																							

APPENDIX C

TABLES

Table 1. Interobserver Agreement

Measure	Calculation Procedure	Baseline	Intervention	Total
Duration of interactive play	$\frac{\text{Shorter duration}}{\text{Longer duration}}$ X 100	84%	100%	92%
# Play actions	$\frac{\text{Agreements}}{\text{agreements + disagreements}}$ X 100	98%	100%	99%
# Requests for instruction	$\frac{\text{Agreements}}{\text{agreements + disagreements}}$ X 100	100%	100%	100%
# Typical Statements	$\frac{\text{Agreements}}{\text{agreements + disagreements}}$ X 100	100%	100%	100%
# Atypical Statements	$\frac{\text{Agreements}}{\text{agreements + disagreements}}$ X 100	100%	100%	100%
# Textual Prompts	$\frac{\text{Agreements}}{\text{agreements + disagreements}}$ X 100	100%	100%	100%
# Gestural Prompts	$\frac{\text{Agreements}}{\text{agreements + disagreements}}$ X 100	100%	100%	100%
	Total average			99%

Table 2. Order of presentation with play materials

Session	Ship	Castle	Forest	Session	Ship	Castle	Forest
1	3	2	1	29	1	2	3
2	2	1	3	30	2	3	1
3	2	3	1	31	1	3	2
4	1	2	3	32	2	1	3
5	2	3	1	33	3	2	1
6	3	1	2	34	1	2	3
7	1	2	3	35	3	1	2
8	2	3	1	36	2	3	1
9	1	3	2	37	1	3	2
10	3	1	2	38	2	3	1
11	3	2	1	39	2	1	3
12	1	3	2	40	3	2	1
13	2	1	3	41	1	2	3
14	2	3	1	42	3	1	2
15	1	3	2	43	2	3	1
16	2	1	3	44	2	1	3
17	1	2	3	45	2	3	1
18	3	1	2	46	1	2	3
19	2	3	1	47	2	1	3
20	3	1	2	48	1	3	2
21	1	3	2	49	3	1	2
22	3	2	1	50	1	2	3
23	2	1	3	51	3	2	1
24	1	2	3	52	1	3	2
25	3	1	2	53	2	1	3
26	1	3	2	54	2	3	1

Table 3. Comparison Analysis

	Taylor & Levin (1998)	Watts (1999)	Present Study
Timing of RCT delivery	1-min fixed-time interval	Variable time a. 30s to 1-min without a verbal or physical exchange	Variable time a. 2-min interactive play b. 1-min solitary play
Fading Procedures	Most-to-least hierarchy	Time-delay	Proximity of script cards
Procedure designed to fade RCT	NO	YES	NO
Target Behaviors	Initiation statements - about play materials	Initiation statements - to play activities	Requesting teacher models/suggestions for play actions/ themes
Stimulus Materials	materials not specified	a. Books b. games c. art supplies d. stuffed animals e. cars f. playground set	3 sets of play materials a. Robin Hood's Forest b. Ship C. Castle
Outcomes	Increases in statements in tactile condition	increases in unprompted initiations	increases in requests for models/suggestions

APPENDIX D

FIGURES

Figure 1. Duration of interactive play across play contexts

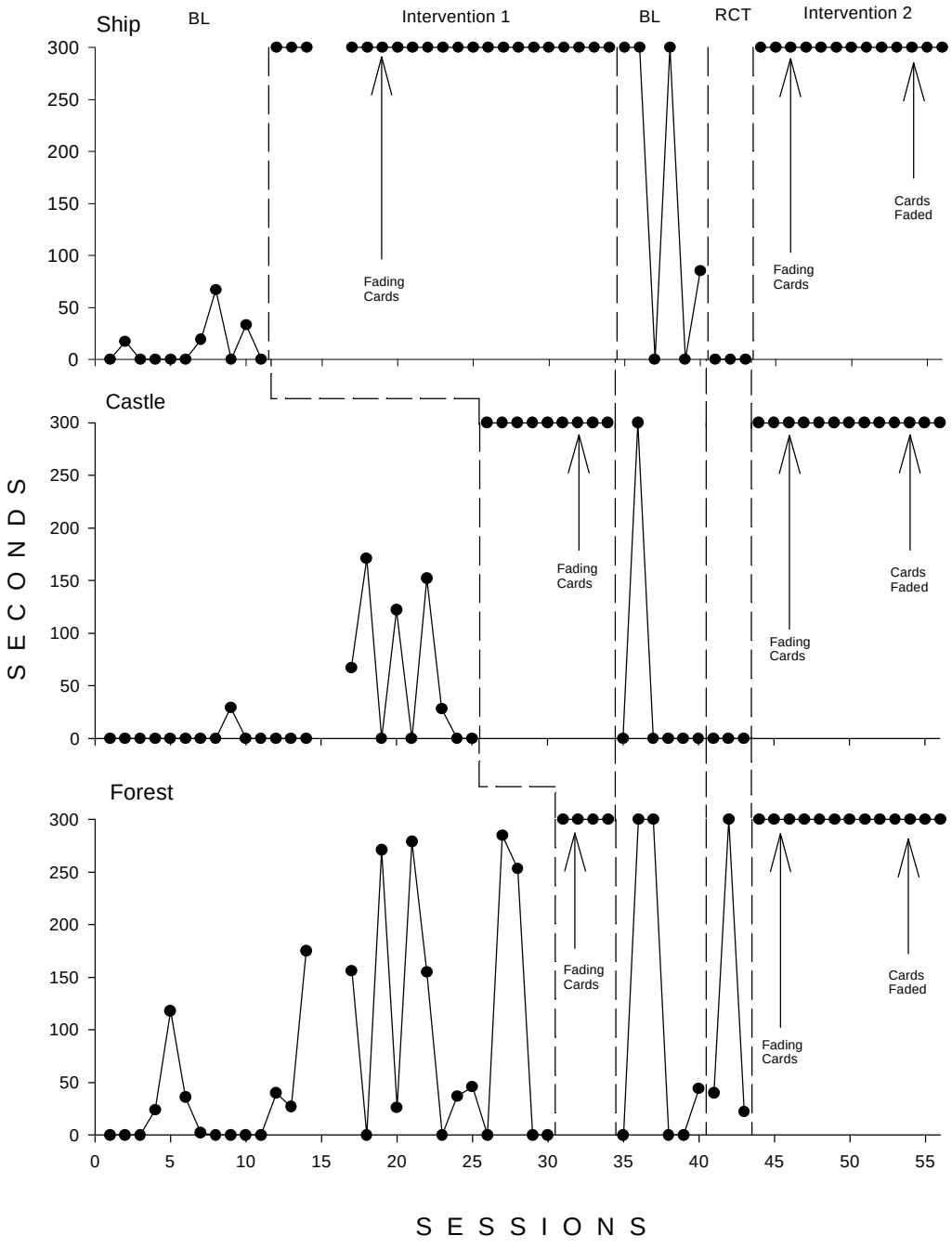


Figure 2. Cumulative number of different play theme topographies

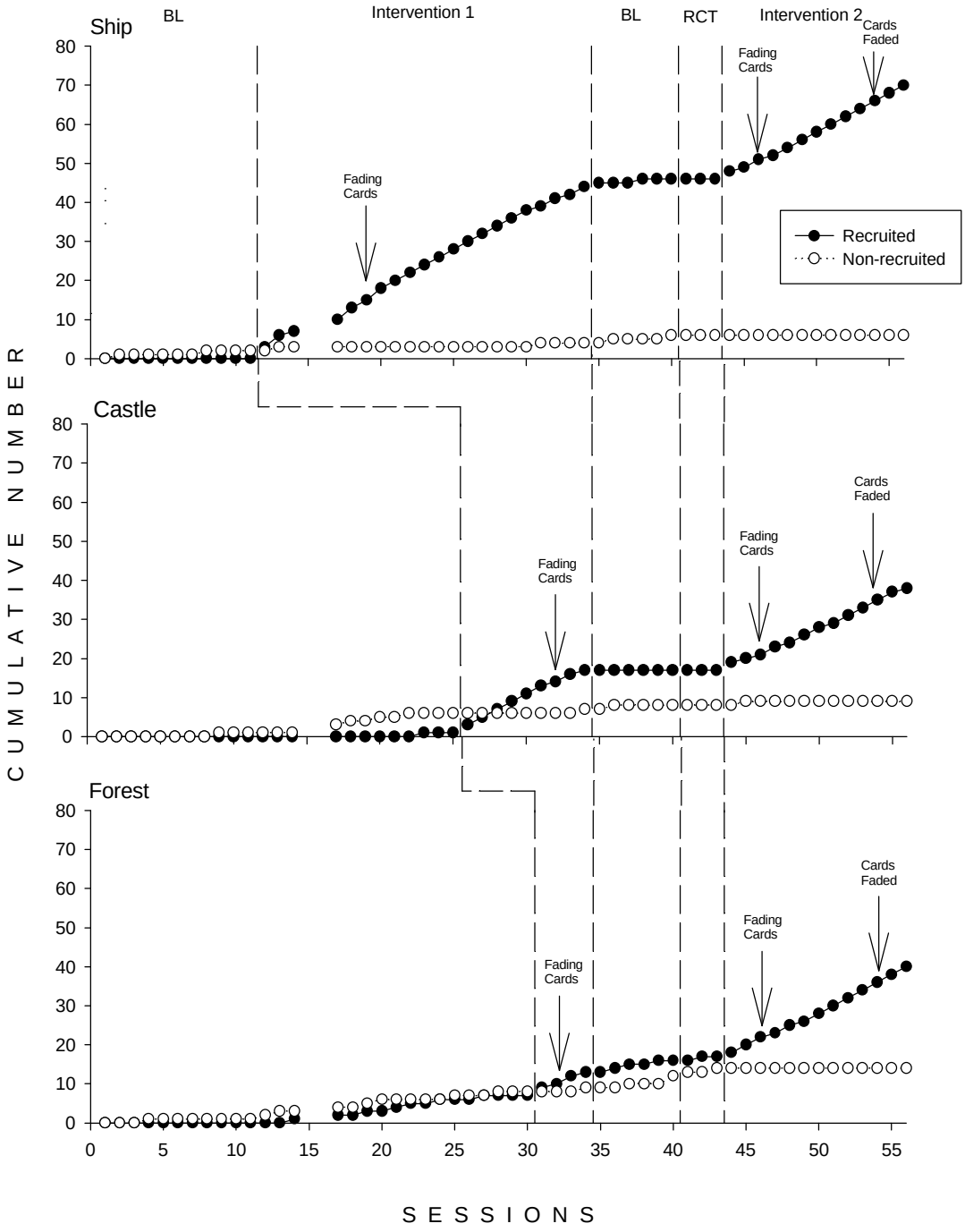


Figure 3. Cumulative number of different play action topographies

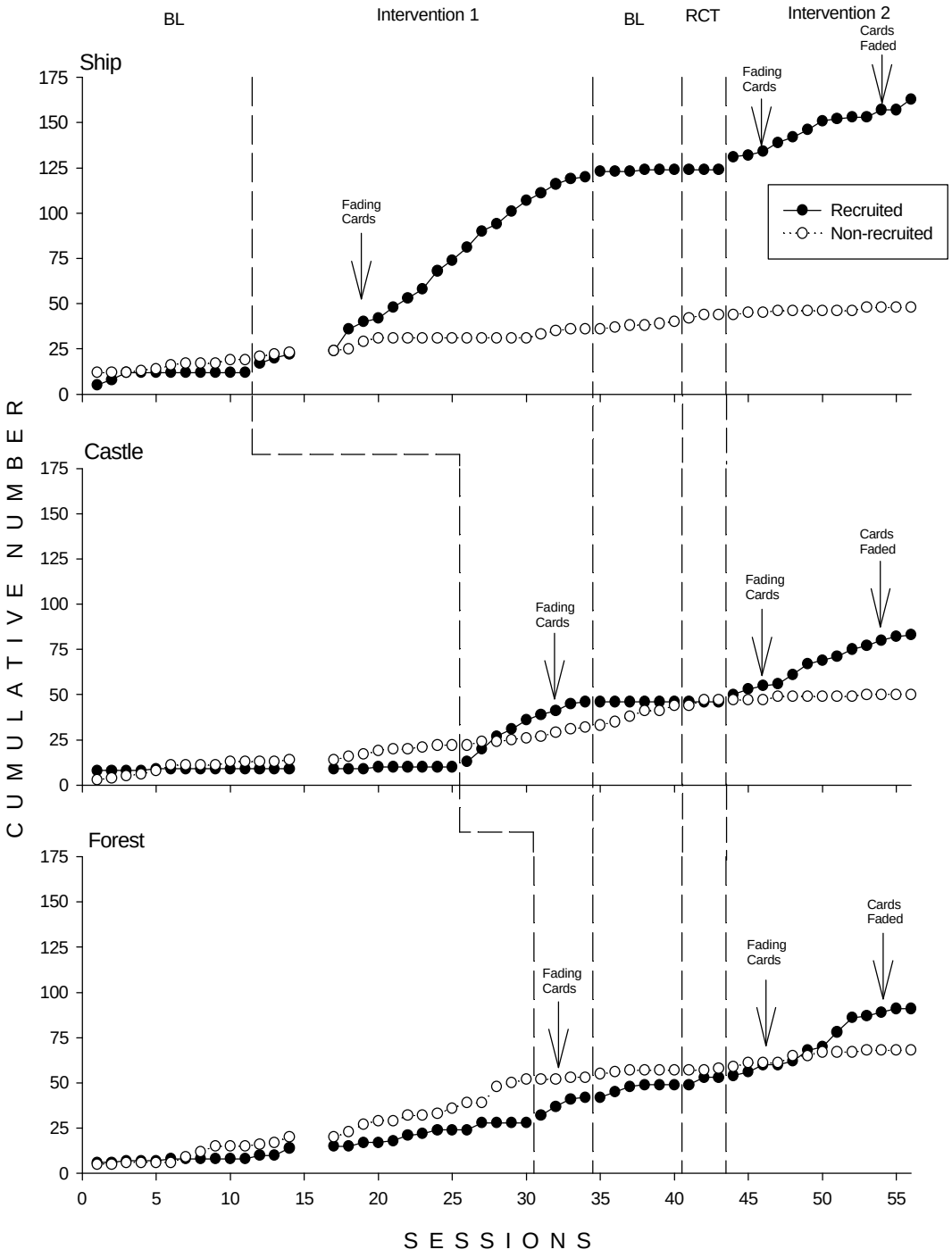


Figure 4. The number of typical and atypical statements

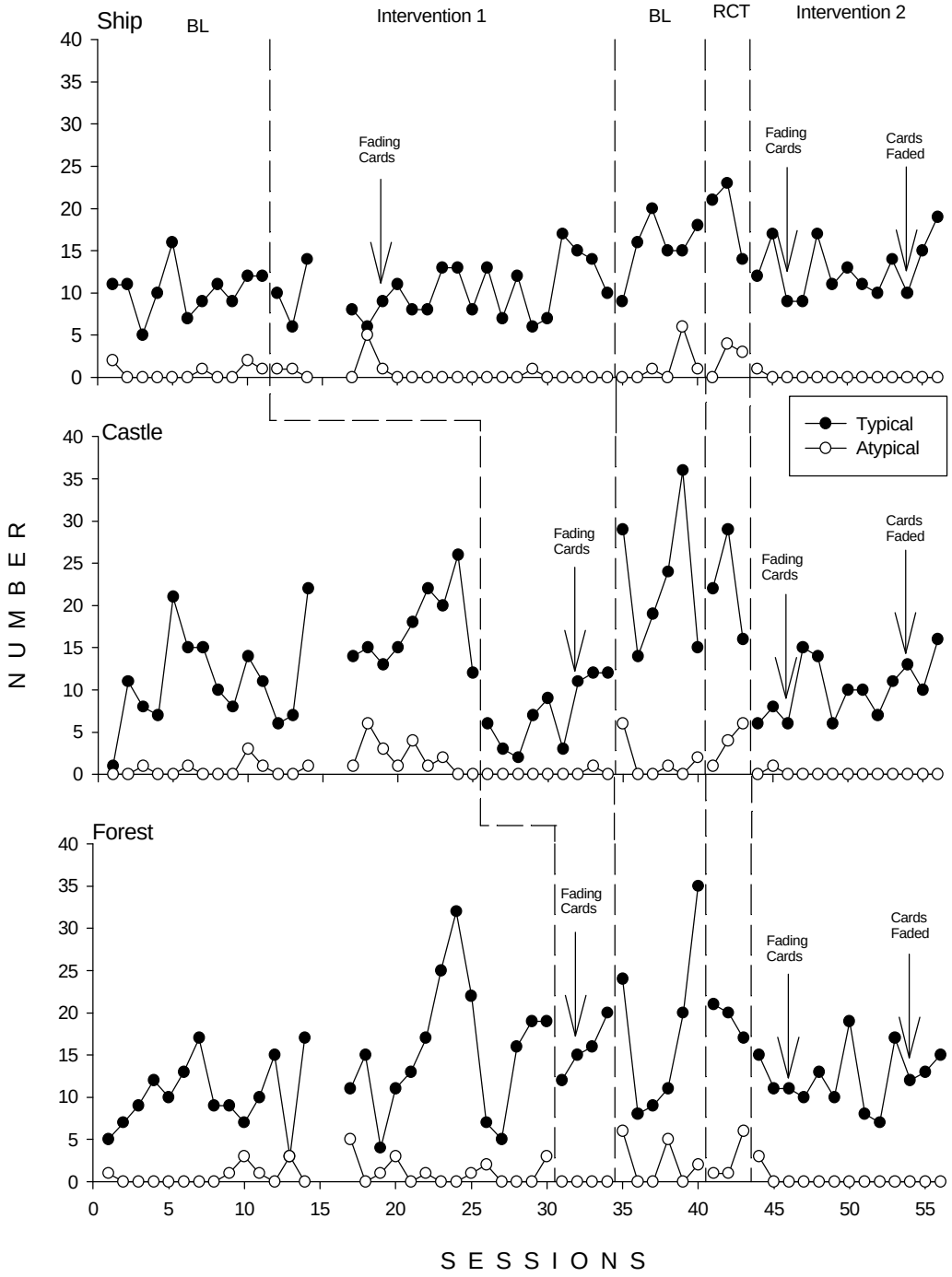


Figure 5. Teacher responses to scripted and unscripted phrases

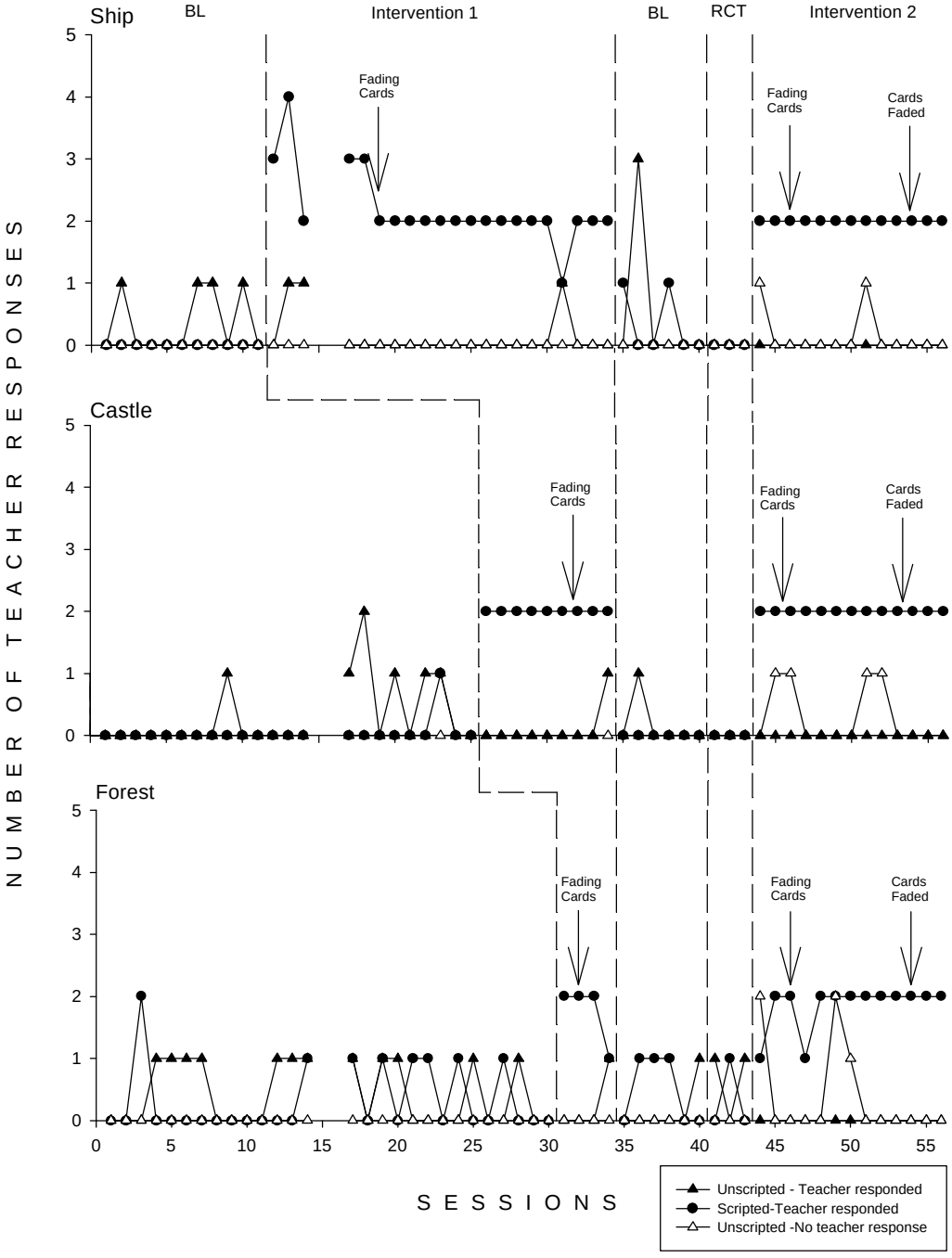
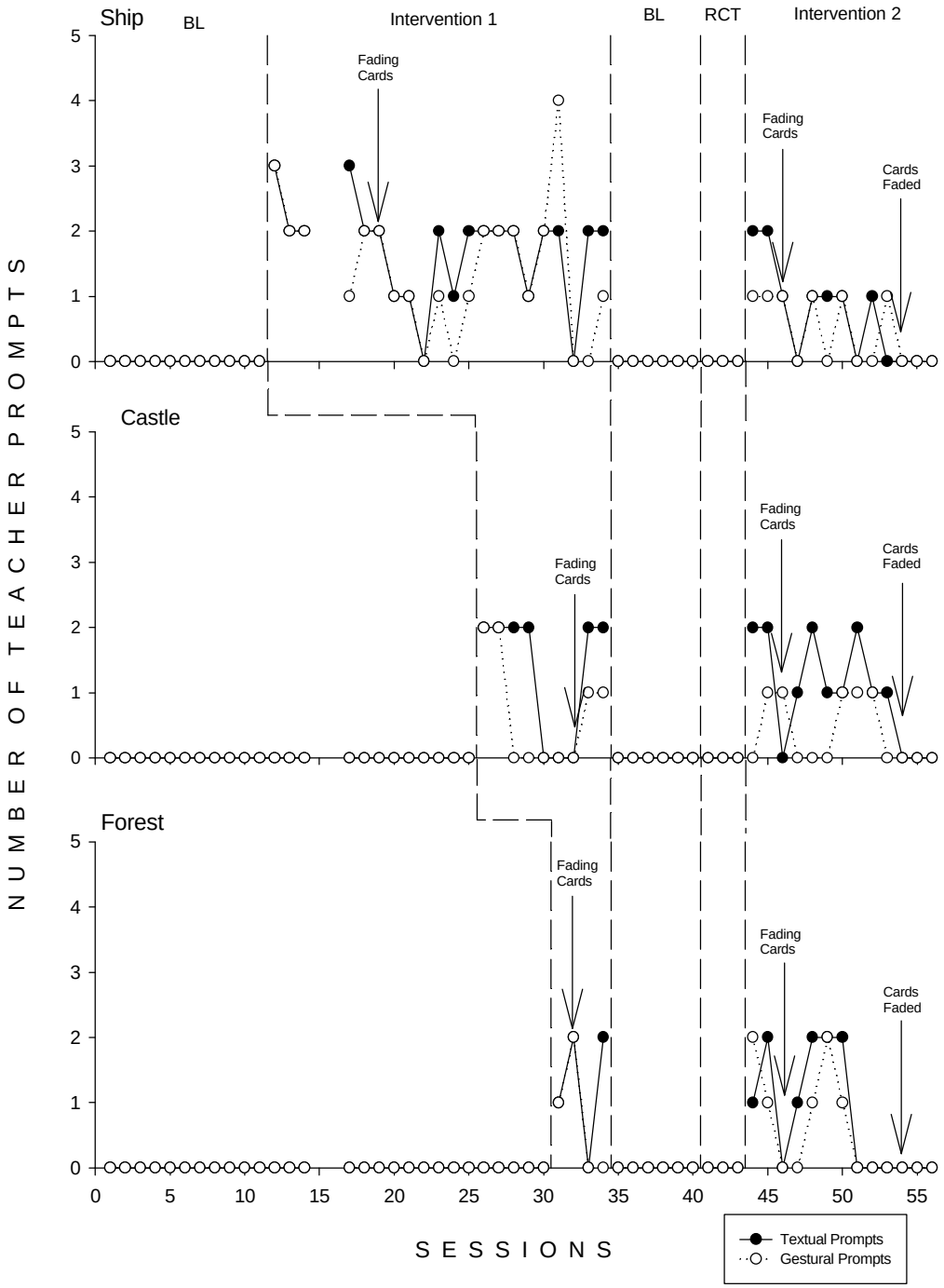


Figure 6. The number of textual and gestural prompts



REFERENCES

American Psychiatric Association (1994). Diagnostic and Statistical Manual of Mental Disorders. Washington, DC: American Psychiatric Association.

Baer, D. M. & Wolf, M. M. The entry into natural communities of reinforcement. In R. Ulrich, T. Stachnik, & Mabry (Eds), Control of human behavior: Volume II. Glenview, Illinois: Scott, Foresman, 1970. PP 319-324.

Cantor, N. L. and Gelfand, D. M. (1977). Effects of responsiveness and sex of children on adult's behavior. Child Development, 48, 232-238.

Coe, D. A., Matson, J. L., Craigie, C. J., & Gossen, M. A. (1991). Play skills of autistic children: assessment and instruction. Child and Family Behavior Therapy, 13, 13-40.

Etzel, B. C. & LeBlanc, J. M. (1979). The simplest treatment alternative: The law of parsimony applied to choosing appropriate instructional control and errorrless-learning procedures for the difficult-to-teach child. Journal of Autism and Developmental Disorders, 9, 361-382.

Fox, J. J., Shores, R. E., Lindeman, D. & Strain, P. S. (1986). Maintaining social initiations of withdrawn handicapped and nonhandicapped preschoolers through a response dependent fading tactic. Journal of Abnormal Child Psychology, 14, 387-396.

Goldstein, H. & Cisar, C. L. (1992). Promoting interaction during sociodramatic play: Teaching scripts to typical preschoolers and classmates with disabilities. Journal of Applied Behavior Analysis, 25, 265-280.

Graubard, P.S., Rosenberg, H., & Miller, M.B. Student applications of behavior modification to teachers and environments or ecological approaches to social deviancy. In E.A. Ramp & B.L. Hopkins (Eds), A new direction for education: Behavior analysis. Lawrence, Kansas: Support & Development Center for Follow Through, 1971. Pp 80-101.

Gunter, P., Fox, J. J., Brady, M. P., Shores, R. E. & Cavanaugh, K. (1988). Nonhandicapped peers as multiple exemplars: A generalization tactic for promoting autistic students' social skills. Behavioral Disorders, 13, 116-126.

Kanner, L. (1943). Autistic disturbances of affective contact. Nervous Child, 2, 217-250.

Kamps, D.M., Leonard, B.R., Vernon, S., Dugan, E.P., Delquadri, J.C., Gershon, B., Wade, L. & Folk, L. (1992). Teaching social skills to students with autism to increase peer interactions in an integrated first-grade classroom. Journal of Applied Behavior Analysis, 25, 281-288.

Koegel, L. K., Koegel, R. L., Hurley, C., & Frea, W. D. (1992). Improving social skills and disruptive behavior in children with autism through self-management. Journal of Applied Behavior Analysis, 25, 341-354.

Kohler, F. W., Strain, P. S., Maretsky, S., & Decesare, L. (1990). Programming positive and supportive interactions between preschoolers: An analysis of group-oriented contingencies. Journal of Early Intervention, 14, 327-341.

Kohler, F. W., Strain, P. S., & Shearer, D. D. (1992). The overtures of preschool social skill intervention agents: Differential rates, forms, and functions. Behavior Modification, 16, 525-542.

Krantz, P. J. & McClannahan, L .E. (1993). Teaching children with autism to initiate to peers: Effects of a script-fading procedure. Journal of Applied Behavior Analysis, 26, 121-132.

McGee, G. G., Almeida, M. C., Sulzer-Azaroff, B. & Feldman, R. S. (1992). Promoting reciprocal interactions via peer incidental teaching. Journal of Applied Behavior Analysis, 25, 117-126.

Odom, S. L., Hoyson, M., Jamieson, B., & Strain, P. S. (1985). Increasing handicapped preschoolers' peer social interactions: Cross-setting and component analysis. Journal of Applied Behavior Analysis, 18, 3-16.

Odom, S. L. & McConnell, S. R. (1992). Improving social competence: An applied behavior analysis perspective. Journal of Applied Behavior Analysis, 25, 239-244.

Odom, S. L. & Watts, E. (1991). Reducing teacher prompts in peer-mediated interventions for young children with autism. Journal of Special Education, 25, 26-43.

Rosales-Ruiz, J. & Baer, D. M. (1997). Behavioral cusps: A developmental and pragmatic concept for behavior analysis. Journal of Applied Behavior Analysis, 30, 533-544.

Sainato, D. M., Goldstein, H. & Strain, P. S. (1992). Effects of self-evaluation on preschool children's use of social interaction strategies with their classmates with autism. Journal of Applied Behavior Analysis, 25, 127-141.

Schreibman, L (1988). Autism. Newbury Park, CA: Sage Publications, Inc.

Seymour, F. W. & Stokes, T. F. (1976). Self-correcting in training girls to increase work and evolve staff praise in an institution for offenders. Journal of Applied Behavior Analysis, 9, 41-54.

Shafer, M. S., Egel, A. L., & Neef, N. A. (1984). Training mildly handicapped peers to facilitate changes in the social interaction skills of autistic children. Journal of Applied Behavior Analysis, 17, 461-476.

Sherman, T.M. & Cormier, W.H. (1974). An investigation of the influence of student behavior on teacher behavior. Journal of Applied Behavior Analysis, 7, 11-21.

Stokes, T. F., Fowler, S. A., & Baer, D. M. (1978). Training preschool children to recruit natural communities of reinforcement. Journal of Applied Behavior Analysis, 11, 285-303.

Strain, P. S., & Fox, J. J. (1981). Peers as behavior change agents for withdrawn classmates. In A. Kadzin & B. Lahey (Eds.), Advance in child clinical psychology (pp. 167-198). New York: Plenum Press.

Taylor, B. A. & Levin, L. (1998). Teaching a student with autism to make verbal initiations: Effects of a tactile prompt. Journal of Applied Behavior Analysis, 31, 651-654.

Watts, K. (1999). Effects of a remote-controlled tactile prompt on the imitation skills of a child with autism. Unpublished master's thesis, University of North Texas, Denton, Texas.

Zanolli, K., Daggett, J. & Adams, T. (1996). Teaching preschool age autistic children to make spontaneous initiations to peers using priming. Journal of Autism and Developmental Disorders, 26, 407-422.